

Cabot (A. J.)

With the Compliments of the Author.

PAPERS UPON  
GENITO-URINARY SURGERY.

BY A. T. CABOT, M.D.,

*Surgeon at the Mass. General Hospital; Clinical Instructor in Genito-Urinary  
Surgery at Harvard Medical School.*

- I. NOTES ON THE NON-OPERATIVE TREATMENT OF ENLARGED PROSTATE.
- II. A CONTRIBUTION TO THE TREATMENT OF RUPTURE OF THE BLADDER.
- III. A SUCCESSFUL CASE OF URETERO-LITHOTOMY FOR AN IMPACTED CALCULUS.
- IV. OBSERVATIONS UPON THE ANATOMY AND SURGERY OF THE URETER.
- V. PACHYDERMIA VESICÆ.
- VI. A CASE OF CALCULOUS PYELITIS. SUPPRESSION OF URINE FOR SEVEN DAYS. OPERATION. RECOVERY.

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## NOTES ON THE NON-OPERATIVE TREATMENT OF ENLARGED PROSTATE.<sup>1</sup>

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THE operative treatment of obstructive disease of the prostate has excited so much interest of late years, and the operations of prostatotomy and prostatectomy have been so earnestly advocated, that this seems a peculiarly fit time to look at the subject from another point of view, and to review the possibilities of the non-operative treatment of this disorder.

The successes obtained by the operative treatment are made familiar by abundant examples, and this important advance in surgical practice is so firmly grounded on sound mechanical principles that its future high value is sure as long as the cases so treated are properly selected.

There have been, however, mingled with these successes, a considerable number of total or partial failures, which show that the obstruction cannot always be cut away, and that in some cases, even when the passage is made free, the bladder does not recover an expulsive power sufficient for the act of micturition.

The exact proportions and conditions of success and failure have not yet been determined; but there is enough uncertainty as to the result of these operations to show us that they should only be resorted to in cases in which milder measures fail to bring comfort and safety to the patient.

Modern methods have also made great improvements in the palliative treatment of hypertrophied prostate, and it is my object to present in this paper some considerations which should not be lost sight of in guiding the care of these patients, and which, though familiar to

<sup>1</sup> Read before the Boston Society for Medical Improvement, October 27, 1890.

specialists, are sometimes not sufficiently borne in mind by general practitioners in whose hands the early treatment of these cases usually falls. A case properly directed from the outset will usually run a course which will keep the question of operation entirely in the background; while a failure to understand the condition at the beginning may start the patient on a mistaken course of treatment, which will bring him into a condition from which an operation offers the only hope of escape.

The general and hygienic treatment of these cases is of great importance; for a judicious arrangement of the clothing may save the patient from many surface chills with consequent attacks of congestion of the prostate. Also, in dry inland resorts, he may safely pass a summer that would have been made miserable on a damp seashore, by aggravation of his trouble. The diet and drink, too, have much to do with the irritating or non-irritating quality of the urine, and the symptoms may often be modified by the administration of medicine.

These matters are passed over here, not because they are not of great importance in the conduct of these cases, but because they are more generally understood, and it is desired to call attention now to their mechanical or surgical treatment, the correct appreciation of which is of the first importance, but in regard to which the general practitioner is not so thoroughly informed.

Guyon has divided the clinical history of enlarged prostate into three periods: (1) That of congestion, affecting mainly the prostate, but also in less degree the bladder and kidneys. (2) That of partial retention of urine. (3) That of serious retention of urine, with distention of the bladder, and usually secondary changes in the kidneys.

This classification divides the cases in accordance with the mechanical condition of the bladder, and is, therefore, useful in helping us to lay out our plan of treatment; for the proper management of the bladder is the key to success in these cases.

The symptoms of the first stage are mainly due to the condition of congestion in the prostate. One of the first things the patient notices is an increased frequency of urination, which is especially marked at night or early in the morning. Guyon ascribes the increase of frequency during recumbency to the passive congestion which becomes more marked when the circulation is quieted by inaction.

Pain is not prominent in the first stage, although there may be some scalding in urination, and a dull aching or dragging sensation in the perineum, the rectum and behind the pubes is sometimes felt.

The force of the stream is diminished by the encroachment of the swollen mucous membrane on the calibre of the urethra, and by the already commencing enlargement of the gland.

The treatment of this first stage is almost wholly hygienic and medical. If the urine is irritating from too great acidity, an alkaline diuretic is indicated. In case of pain anodynes may be required. Counter-irritation to the perineum is sometimes useful, and hot applications around the pelvis will do something to relieve irritation.

In the absence of complications, and before there is any retention of urine, interference with instruments should be avoided, as it only aggravates the congestion and introduces the danger of infection.

It will sometimes not be easy to determine, from the symptoms alone, whether a case is still in the first period of the disease, or whether there is already retained urine. To decide this, it will be necessary to pass a catheter after full urination. When this is done, precautions should be taken to reduce the irritation of the catheterization to a minimum. To this end, it is well to use the catheter at the patient's home and to introduce it at night, when he will have a long rest in the horizontal position afterwards. The instrument selected should be small (No. 6 English), of soft rubber, and the utmost cleanliness should be observed in its use. Even with all care, a little irritation will sometimes be set up, but will usually subside under rest and simple remedies.

It sometimes happens, when a catheter is used carelessly or unadvisedly in the first period, that the congestion is so increased by its use as to give rise to inflammation of the neck of the bladder, with uncomfortable, sometimes serious, symptoms. When this happens, it is the more unfortunate, for it often convinces the patient, and sometimes his physician, that his bladder is unduly sensitive to the use of instruments and that the catheter must never be used again, for fear of even more serious consequences. If then, afterwards, the disease moves on into the second or third stage of retention or distention, it is extremely hard to persuade the patient to again resort to catheterization.

As the second stage establishes itself, and the bladder begins to con-



tain residual urine, the discomforts of the first stage become more pronounced. Sometimes an unsatisfied feeling is left at the end of urination, as if the bladder had not wholly freed itself. This feeling is, however, often wanting, and its absence should not put one off the track of looking for residual urine.

The frequency of urination, which during the first stage may have been most marked at night, becomes, in the second period, almost equally troublesome in the daytime. As the bladder is always partly full, it takes but a small additional quantity to distend it to its full capacity, and the calls to urinate are frequent and imperative. Sometimes, however, the bladder shows remarkable tolerance of distention, and the amount of retained urine becomes considerable before the patient is made uncomfortable by it.

The only positive means of ascertaining the condition of the bladder is by physical examination; and this should be made in every doubtful case. If the bladder is very full, it may be perceived above the pubes by palpation and percussion, but a moderate degree of retention cannot be detected in this way. During the rectal examination of the configuration of the prostate, the finger can be carried up on to the posterior bladder-wall, and by combined manipulation with the other hand over the abdomen, may determine with some accuracy the degree of distention of the bladder. The passage of the catheter is, however, the most accurate means of settling the amount of retention.

It is wise to use the same amount of care in commencing the use of the instrument in this stage as in the first. We are never certain that the kidneys have not already begun to be affected; and if they have, an undue amount of irritation of the urethra or neck of the bladder may precipitate an attack of renal congestion. Also it is of the first importance not to set up an inflammation in the prostate which may so increase the obstruction of the urethra as to wholly stop the natural passage of the water and so oblige the patient to depend on the catheter to relieve the bladder.

If residual urine is found, we shall be guided in our subsequent treatment by the amount of it. In case there is but three or four ounces of it, the catheter should be passed once a day to draw it off, preferably at night. Not infrequently it will be found that under this systematic use of the catheter the amount of residuum steadily dimin-



ishes, until finally the bladder is again capable of entirely expelling its contents. In short, the disease is moved back from the second stage to the first. When this occurs, the catheter may be dispensed with, but should be passed occasionally to make sure that the urine is not again accumulating.

If the residuum does not diminish under the regular use of the catheter once a day, the water should be drawn also in the morning after the patient is dressed; and if a residuum is found at that time too, it is well to empty the bladder in the morning as well as at night.

The time after dressing is selected for this test, because it is a common habit of these patients to pass their water several times while first moving about in the morning, so that the bladder empties itself more completely at that time than at any other part of the day. When the residual urine is in large amount (from eight to sixteen ounces), it indicates an amount of obstruction in the urethra and a loss of power in the bladder that is not likely to grow less, and that will probably require the regular use of the catheter for the rest of the patient's life. Even in such a case as this, however, the patient should begin gradually, and accustom himself by degrees to its use.

After the catheter life is established, it is usually found sufficient to empty the bladder four times in twenty-four hours. Three times a day, or once in eight hours, will sometimes suffice, but if the least uneasiness is felt, the bladder should be emptied oftener; for a painful, forcible retention of urine after the desire to pass it is felt, occasions more irritation to a sensitive bladder than a somewhat more frequent introduction of the catheter. In order to reduce the necessary irritation of catheterization to a minimum it is important to select the proper instrument for each case, and to see that it is passed in the best manner.

When it will pass, a soft, rubber catheter is the best instrument, as it can do no harm to the urethral walls, and requiring no guidance, it can be entrusted to an unskilful patient. A small size is the best, unless the urine contains thick mucus that will not flow easily.

If the soft rubber catheter will not pass, we must use a stiffer instrument. Sometimes a French bougie-pointed catheter will succeed in such a case, and it, too, has the advantage that its introduction does not require skilled guidance. It is stiff enough, however, to perforate the the urethral wall if pushed with force against an obstruction, a danger

which the patient should fully understand, and should have the intelligence to avoid. The other instruments that are used for these cases are given particular shapes to avoid the pockets and projections which obstruct the passage.

In the old patients from which these cases are drawn the urethra is a comparatively lax tube as compared with the condition in younger men. The firmness of the urethral walls is largely dependent upon the support of the muscles that surround it, notably of the accelerator urinæ muscle. As the muscular fibre relaxes with old age, the walls of the urethra offer less support and guidance to instruments. The first point where the lack of support is felt is in the bulbous portion, in front of the triangular ligament. As the urethra passes through this fibrous sheet, its walls are held up and kept in a constant relation with the arch of the pubes, while just in front of this opening the bulbous urethra, when it lacks the support of the muscle surrounding it, sags down and forms a pocket. This pocket being situated on the lower side, just where the passage turns upward towards the bladder, is almost certain to catch the point of any straight instrument. If a soft catheter catches there, a French bougie catheter is even more likely to, as it is somewhat stiffer, and follows the floor of the passage even more closely in turning the corner below the pubes. Just in front of the prostate the same mechanism is likely to form a similar pocket.

After entering the prostate, the lateral walls of the urethra may be pressed snugly together, and so resist the passage of a soft, pliable catheter; but the only obstruction that is likely to catch the point of the instrument is the third lobe, which, when enlarged, projects from the floor of the canal; either as a prominent tumor or as a bar.

Thus we see that all of the obstructions likely to resist the passage of an instrument are on the floor of the passage; and in order to avoid catching an instrument on them, its point must be made to run along the roof of the canal.

The *coudé* catheter of Mercier is a familiar instrument constructed for this purpose, and when properly managed, and passed so that its point is directed upwards, it rides over the obstructions described above most admirably, and can be successfully used by patients of moderate intelligence.

There is one criticism that I should like to make on these instruments, as at present furnished, and that is that the turned-up end is not long enough to ride over many of the obstructions that exist on the floor of the passage. The end should be, at least, three-fourths of an inch in length; and, as I have often proved, an instrument with such an end will frequently succeed in passing when one with the shorter beak now furnished has failed.

Lastly, we come to speak of stiff instruments, which require especial guidance, and to which various forms have been given.

This subject is so thoroughly treated of in the books that there is little that is new about it; but it is worth while to emphasize the importance of avoiding pitfalls on the floor of the urethra in their introduction. The pressure of the hand in the perineum as the triangular ligament is being passed, and of the finger in the rectum as the point rides into the prostate, will often make easy what would otherwise be almost impossible. And it is well to know that this pressure must often be very great indeed to accomplish its object.

If the catheter is going right in one of these cases, it slips along with ease, and if it is caught and will not advance, it may be concluded that it is not rightly following the canal.

If false passages already exist in the urethra, it is a good plan when the point is caught to always withdraw for a considerable distance and then to try forward first on one wall of the passage and then on another, always remembering that in the majority of cases the false passage is on the floor.

We must expect in a certain number of cases to see a cystitis develop on commencing catheterization. This may be due either to the too sudden emptying of a distended bladder, or to the introduction of dirt upon the catheter, or to the irritation from the constant use of the instrument. Usually the cystitis due to this cause can be kept within moderate bounds and presently subsides as the bladder and urethra become accustomed to the changed conditions.

It is important that the aggravation of symptoms caused by this inflammatory onset shall not lead the patient or doctor to infer that the catheter is doing harm and should be given up. It should, however, lead to a careful consideration of the method in which the catheter is being used, and extra care should be taken to see that the instrument is not causing any unnecessary irritation.



Sometimes in spite of all care, attacks of inflammation of the prostatic urethra and bladder arise, and give much trouble. The urine becomes thick with muco-pus, and there may be considerable hamaturia. The frequency of urination under these circumstances becomes very troublesome, and often accompanied by much painful spasm of the bladder.

When this condition of things becomes established, especially in a patient who cannot void his urine, and who therefore is constantly suffering from spasm, something must evidently be done to give the bladder a rest.

It is under these circumstances that an operation for bladder drainage, and for the removal of obstructing portions of the prostate is often undertaken, and would seem to be proper. There is, however, another means of draining and affording rest to the bladder which is very efficient, and is much less dangerous than any operation. It is by fastening a catheter into the bladder (*sonde à demeure*). It is often surprising to see how quickly and entirely one of these sharp attacks of cystitis with bladder tenesmus is relieved by the continuous drainage through a catheter. The urine often clears with great rapidity.

The syphonage which is obtained by carrying the urine through a rubber tube into a bottle on the floor, is a valuable aid to keeping the bladder really empty, and forcibly sucks out clots of mucus and blood, that would certainly stop up a catheter that only dropped into a vessel between the thighs.

It is important, in adjusting the catheter, to so fasten it that the point shall neither press into the posterior wall of the bladder, nor escape into the prostate. Four threads fastened to the catheter, and then attached to a band of adhesive plaster about the penis, is a common and tolerably efficient way of fastening it. The disadvantage of this method, however, lies in the fact that the penis is a movable organ, and sometimes allows the catheter to come so far out of the bladder that its point catches in the prostate.

A safer method is to fasten the threads to a ring of rubber tubing that encircles the penis and scrotum, and is held in place by being fastened in front to a waist-band, and behind by two perineal bands carried around in the folds of the nates, and brought up to the waist-band on the sides. This fastening holds the ring of rubber firmly



down against the pubes, and if the catheter is then secured to the ring, it is held in constant relations to the pubes and bladder, no matter what changes of position the penis may undergo. It should be fastened as before by four threads, two of which are attached to the ring well towards the back to prevent the catheter riding up.

The catheter usually used for this purpose is the English gum elastic catheter, which soon gets soft and pliable throughout all that part of it that is in the urethra, but of which the outer part retains its stiffness sufficiently to prevent its doubling up, and so coming out.

A soft rubber catheter may be fastened in by attaching to it strips of adhesive plaster, which run back over the penis, and are held there by an encircling band of plaster. These plasters must be attached to the catheter close down to the meatus, as otherwise the catheter will work out of the urethra beside them. In fact, if there is much expulsive power in the urethra, it will often expel the soft, flexible catheter in spite of the most carefully arranged fastening.

When a catheter is properly arranged there should be a steady drip of urine from the tube, and if this ceases for more than a few minutes, the cause of the stoppage should be investigated. It will usually be found due to one of three causes; either the catheter is too far in, or it is too far out, or it is stopped by a plug of blood or mucus.

If moving it in and out does not start the stream, the tube may be stripped with the fingers so as to empty it of air, and it will then act by suction to draw the clot along. If this does not succeed, the catheter may be washed out with a syringe.

The catheter should be taken out and a clean one introduced every four to six days, as in a longer time it becomes encrusted with the salts of the urine, and acts as an irritant.

Ordinarily, such drainage as this soon relieves the symptoms, and it can be discontinued, and ordinary catheterization resumed in from a week to a fortnight. If relief does not follow, it is probable that there is some undiscovered cause of the continuance of the trouble, perhaps a stone, or pyelitis.

The third stage of the disease always comes on insidiously. The tolerance of the bladder is so great that it becomes greatly distended without the patient being aware of anything more than a frequency of urination which he knows to be common in old men, and therefore neglects.

Finally, it is often the incontinence which results from overflow that leads him to consult a surgeon. Long before this, however, the kidneys have usually begun to suffer serious changes. There is almost always an interstitial nephritis, which may or may not be associated with dilated ureters and pelves. Not infrequently the secondary heart changes of Bright's disease may be discovered. When this condition is found thoroughly established the surgeon has a difficult problem to solve, for he knows that if left to itself the disease must soon prove fatal, and he has also great reason to fear that any interference may only precipitate the fatal result. Guyon has laid down a rule, for deciding whether to interfere in these cases, that is a practical one. He says, that such patients, who are almost always suffering from general debility usually associated with a disturbed digestion should be put upon a tonic course of treatment, and if they respond and improve under this, that it shows a sufficient power of recuperation to make it advisable to use the catheter, and to endeavor to better the condition of the bladder. If they do not improve under general treatment he advises letting the bladder alone.

When it is decided to interfere in such cases, it is even more important than in the second stage to take care that the bladder is not emptied too abruptly.

The patient should be put to bed, and but a portion of the contents of the bladder should be drawn off at a time. It may take a week or more to gradually reduce the amount of residuum to the point where it will be safe to empty the bladder.

If, before the patient is accustomed to the use of the instrument, an attack of inflammation sets in, there is great danger that it will extend up along the ureters and set up a pyelo-nephritis.

This backward extension of the inflammation may possibly be prevented by establishing thorough drainage of the bladder, so that the urine shall flow out of it as fast as it comes down from the kidneys. This may be accomplished either by cystotomy, or by a permanent catheter. The patients with partly disabled kidneys do not bear cutting operations well, and the catheter drainage, if it works well, would therefore be preferable in these cases.

## A CONTRIBUTION TO THE TREATMENT OF RUPTURE OF THE BLADDER.<sup>1</sup>

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SINCE the appearance of Mr. Rivington's monograph upon "Rupture of the Bladder," in 1884, a number of cases of intra-peritoneal rupture of the bladder have been treated by laparotomy and suture of the rent. The success which has attended these cases, and also the many instances of repair of bladders wounded during laparotomy, have gone far to establish the rule laid down by Mr. Rivington that when an intra-peritoneal rupture is made out, an immediate laparotomy should be done. The importance of early interference in these intra-peritoneal cases is so evident, that a surgeon procrastinating an operation even for a few hours cannot easily find justification for his delay.

It not infrequently happens, however, that the first symptoms of bladder rupture do not clearly show whether the rent is intra- or extra-peritoneal, and the delay necessary to settle this point allows time for an inflammation to gather headway, which operative measures are afterwards powerless to check. It is the purpose of this paper to consider the conditions of extra-peritoneal ruptures of the bladder, and to formulate, if possible, rules for operative procedure, which can be applied early, without waiting for an exact diagnosis.

Usually the symptoms of rupture of the bladder are tolerably distinct, and it is not intended here to go into a consideration of them, for they have been thoroughly described in many treatises and articles on the subject. As, however, it is important, before undertaking any operative procedure to demonstrate beyond doubt, if possible, the existence of the lesion for which the operation is done, I wish to speak

<sup>1</sup> Read before the American Association of Andrology and Syphilology, Washington, September 23, 1891.

of the only physical test that seems to me to offer confirmatory evidence at all conclusive of bladder rupture. I refer to the injection of fluid which afterwards does not return through the catheter. This method, suggested by Dr. Weir, has served the writer well on two occasions in establishing the diagnosis of rupture of the bladder, and twice in excluding the bladder in a general injury of the abdomen, which caused a profuse hæmaturia.

In order that the evidence obtained by this method shall be reliable, the injection should be repeated several times, and care must be taken that the catheter lies well in the bladder, and that it is not occluded by clots. With attention to these particulars, if the boric solution injected does not all return, it is conclusive evidence of rupture of the bladder. Sometimes, especially in intra-peritoneal rupture, more fluid returns than is injected, and at the next injection the amount returned may be less than that thrown in. Such variations are very conclusive of rupture.

The only conditions under which this test might fail to demonstrate a rupture that existed would be when the rent was so small that no considerable extravasation of the bladder contents could take place, and in case of a valvular closure of the bladder wound, as occurred in one case through the prolapse of a coil of intestine into it.

Dr. Keen has suggested the substitution of air for water in this test, and says that if no rupture has occurred, the bladder will appear in the hypogastrium as a rounded tympanitic tumor, while, if there be a rupture, the air will fill the general peritoneal cavity. In this he only takes into account intra-peritoneal ruptures, and might altogether miss the detection of an extra-peritoneal rent. Also the gas does not admit of such exact measurement as a fluid.

Suppose now that the evidence of rupture of the bladder is distinct, and that the injection of fluid has confirmed this diagnosis, but there is still doubt whether the rupture is into the peritoneal cavity or not. The practice, hitherto, has been to endeavor to proceed in such a way that if the rupture is extra-peritoneal, that fact shall be found out before the peritoneal cavity is opened. This plan was adopted when the peritoneal cavity was viewed with an awe that has gradually disappeared as we have become more familiar with its tolerance of manipulation, and the fear of unnecessarily injuring the peritoneum, with the



desire for an accurate diagnosis before proceeding to operation, has often led to delays which have been fatal, by allowing time for a serious inflammation to be set up.

It would seem, therefore, worth while to open the subject anew, and see whether with our modern views we find any reason for changing the older practice.

The object which the surgeon has in view in approaching an extra-peritoneal rupture is to provide adequate drainage for the urine which escapes from the bladder, and not to close the opening. Ordinarily, these extra-peritoneal rents are inaccessible to the application of sutures, and even in those cases of anterior ruptures where sutures could be placed, the tissues, infiltrated with urine, are not in a condition favorable for healing, and the danger of secondary extravasation of urine would be great.

Some writers advise that cases of extra-peritoneal rupture shall be treated by simple drainage of the bladder, either through a perineal wound, or by a retained catheter (*sonde à demeure*). While this plan may be sufficient to prevent any further extravasation of urine, it evidently affords very insufficient drainage for the urine which has already escaped into the tissues, and affords no adequate outlet for the pus and masses of sloughing tissue, which are certain to follow from the contact of the urine. It is therefore a very uncertain method, leaves the result mainly to chance, and has not been followed by a measure of success sufficient to recommend it. It is generally accepted, therefore, that drainage of the urine that has escaped from the bladder is a prime necessity.

In order then to treat an extra-peritoneal rupture in the best way, it is important that the operator should know where the rent is, and in what direction the urine is forcing its way through the loose peri-vesical connective tissue. If he has this knowledge, he can make an opening into the extravasation from the nearest available point on the surface, and can establish the most direct drainage possible. Without this knowledge he has to make his operation gropingly, and even if he reaches the extravasated urine, he may so place his tubes that the drainage is only partial and ineffectual.

A study of the reported cases of extra-peritoneal ruptures shows that the urine may be effused in several directions. It may infiltrate up

beneath the peritoneum on the anterior wall of the abdomen; it may fill the tissues about the neck of the bladder; or it may escape beneath the peritoneum on one side or the other of the pelvis, and run up in the loose connective tissue towards the kidney. It is usually impossible to tell from the early symptoms, in which of these directions the effusion is to be looked for, and, indeed, it may extend in two or three directions at once.

Mr. Rivington has suggested that in cases where a doubt exists whether the rent is intra-peritoneal or extra-peritoneal, an incision shall be made into the prevesical space, and if no rupture is found in that quarter, that the peritoneum shall then be opened. The disadvantage of this plan is that if any effusion of urine is found in the prevesical space, it is impossible to tell without a good deal of separation of the tissues whether it extends down on one side or the other towards the back of the pelvis, or whether, as has happened in many of the reported cases, there has been more than one rupture, and yet, on the correct appreciation of these points depends the intelligent placing of the drainage-tubes, upon which success or failure depends. It seems, therefore, as if this incision would often leave us uninformed on important points even when the effusion is found.

Moreover, if an effusion is opened in the prevesical space, and it then becomes necessary to open the abdomen to treat an intra-peritoneal rupture, or to get a fuller understanding of the case, the operator is placed in the unpleasant position of having to open a urinary extravasation directly into the peritoneal cavity, and it will afterwards be difficult to so closely suture the peritoneal wound that no infection shall take place through it.

The cases in which the prevesical incision is applicable are those in which the rupture is in the front wall of the bladder, just above the prostate, and in which the effusion is small or circumscribed. Unfortunately, it is not often possible to diagnose these cases before operation, though this condition may be suspected when there is fracture of the pubes with pain and tenderness confined to the hypogastric region.

In Dr. Weir's case, which was of this sort, the symptoms were of moderate severity, and for forty-eight hours the injury was "considered as a slight urethral laceration." On the fourth day, when the operation was done, the circumscribed effusion above the pubes could be made out by percussion, and the incision was made directly into it.

Another plan proposed is to make a median cystotomy, and with the finger in the bladder to search for the rents. Harrison and Weir advocate this measure, but in a case in which Mr. Harrison applied it, a second rupture in the trigone went undetected; and it is plain that an intra-vesical exploration, even if the rents are found, will not tell us in what direction the urine is forcing its way through the tissues, and consequently leaves us in doubt as to where the drainage should be placed. So that unless we mean to rely on the simple perineal drainage of the bladder in all extra-peritoneal ruptures, we shall often be left in doubt as to the further treatment of the case even after exploration of the bladder.

How can we then best obtain a knowledge of the condition of things in a doubtful case of extra-peritoneal rupture, and so put ourselves in a position to act understandingly and efficiently? I think that this knowledge can best be gained by opening the abdominal cavity, and so getting an opportunity to thoroughly inspect and palpate the parts about the bladder.

A simple exploratory incision into the abdomen carries with it a mortality risk of from one to three per cent., while the information gained by such an inspection enables us to treat the case with so much more directness and thoroughness that we increase the patient's chances of recovery vastly more than we jeopardize them by the abdominal opening.

The following case is reported to illustrate this point:

D. P. W., a strong man of about fifty-five, was seen by me in June, 1890. He had been suffering through the winter from frequent and painful micturition, and up to the time I saw him had been passing water almost continuously, the intervals being but a few minutes in length.

Upon examination a stone was to be felt in the membranous urethra, both with the sound and with the finger in the rectum.

June 6th, he was etherized for operation. A large sound was passed, and with it the stone was easily pushed back into the bladder. A boric solution was then injected preparatory to doing a litholapaxy. The injection was strongly resisted by the bladder, which was closely contracted, and the water escaped around the catheter as fast as it was thrown in. After the ether narcosis was more profound, a rubber band was tied lightly around the penis to keep the water from escaping. An ounce and one-half of boric solution by measurement was then injected, and the lithotrite was introduced. The stone was caught at the first attempt. It was very small, and required but one crushing to entirely reduce it to fragments. While the lithotrite was in, it was noticed that the bladder contracted strongly, fore-

ing some drops of water out along the groove of the instrument. The lithotrite was then withdrawn, and the tube for washing out the bladder was introduced.

It was quickly found that while the water could be easily injected into the bladder, none of it returned, so that it presently became evident that there must be a rupture of the bladder allowing the solution to escape from it. It was at once decided to do a laparotomy in order to discover if possible where the rent was, and to repair it if it was found to be intra-peritoneal. An opening was made in the middle line, midway between the umbilicus and the pubes. There was no fluid in the peritoneal cavity, and upon examining the region about the bladder it was found that the sub-peritoneal cellular tissue lying behind the bladder and running up towards the left side of the pelvis was distended with fluid. A small bit of gravel could be detected in the loose tissue behind the bladder.

It was evident that this collection of fluid ought to be drained behind the peritoneum, and after its extent and distribution had been accurately made out, the abdominal wound was closed with sutures, and sealed with iodoform gauze and collodion. An opening was then made in the left inguinal region, such as would be used for tying the common iliac artery. Through this the peritoneum was pushed up with the finger until the space behind the bladder was reached. Fluid, colored with blood, began at once to escape in considerable quantities through this wound. A drainage-tube was introduced into the pelvis behind the bladder, with a bend in it where it passed over the iliac vessels, which were so exposed to the pressure of the tube that fears were entertained of their sloughing under it.

The patient was then put into the lithotomy position, an opening was made into the membranous urethra, and through this a tube was introduced into the bladder for perineal drainage. The finger introduced into the bladder felt a trabeculated, closely contracted cavity, but the exact locality of the rent could not be detected. A few fragments of gravel were removed. The tube in the perineal wound was attached to a longer tube which ran over the side of the bed into a bottle, and through this the urine drained very satisfactorily.

The cavity in the pelvis soon began to suppurate profusely, and to discharge many large shreds of sloughing, connective tissue. The tube was taken out after a few days, and the wound was irrigated two or three times a day. During the first few weeks injections made into the bladder escaped through the opening in the side. When the sloughs ceased coming, and the cavity dwindled down to a deep fistulous track, a small tube was inserted, and this was gradually shortened as the parts healed behind it.

It was not until March, 1891, that the opening in the groin finally closed, and the perineal tube was taken out for good. This change might probably have been made sooner, but was delayed on account of the timidity of the patient. The bladder was naturally small after such long drainage, but no smaller than it had been before the operation. He was able to hold his water only half an hour. He himself was in better condition than he had been for years, and during the spring of 1891 weighed more than he ever did in his life.

In June a little gravel was discharged through the perineal opening, relieving some discomfort from which he had been suffering for about a month.



The rupture in this case was probably caused by the violent contractions of the bladder when the exit of the urine through the urethra was obstructed, and was undoubtedly due to the giving away of some thin-walled diverticulum, or hernial pouch of mucous membrane, projecting between the bundles of the hypertrophied muscular coat. The manipulation of the lithotrite was perfectly easy. I felt sure that the wall of the bladder was not caught in it, and although the rupture may have occurred at the first compression of the litholapaxy bulb, yet the water entered the bladder so easily as to occasion surprise, and to make me think that the rupture had already taken place. The case is a warning against the use of force in injecting even a small quantity of water into a diseased bladder.

In this case the necessity for prompt action, and the impossibility of making, upon an etherized patient, a diagnosis between an intra- and an extra-peritoneal rupture compelled us to resort to an incision into the abdomen in order to find out what we had to deal with.

The moment we had made this inspection the case was clear, and we were able to proceed intelligently to remedy the unfortunate condition.

The certainty with which we could proceed after the abdominal incision, was in such marked contrast to the condition of uncertainty before, that the question at once arose: Is not an exploratory laparotomy often a necessary first step to the intelligent treatment of extra- as well as of intra-peritoneal ruptures of the bladder?

A study of the literature of extra-peritoneal rupture of the bladder has led to the feeling that this question should be answered in the affirmative, and I believe that in many such cases a preliminary exploration of this sort will furnish information that will greatly better the chances of recovery.

I would suggest then, for your consideration, the following rules:

(1) When an intra-peritoneal rupture is made out, an immediate laparotomy, with suture of the bladder wound and subsequent drainage of the bladder, should be done.

(2) When a reasonable doubt exists as to whether the rupture is intra-peritoneal or not, an immediate laparotomy should be done.

(3) If an extra-peritoneal rupture is made out, and uncertainty exists as to the direction in which the urine is extravasated, a laparotomy

should be done for exploration to ascertain how the drainage may best be placed.

(4) In the case of fracture of the pubes with evidence that urine is extravasated in the prevesical space, an incision should be made in the suprapubic region, a tube should be carried to the bottom of the effusion, and a median or lateral lithotomy should be done for drainage of the bladder.

Exception. Occasionally, in cases of severe injury with much shock, when a long operation could not be borne, a median lithotomy may be hastily done for drainage, and the opportunity may be taken for exploration of the position of the rent, to serve as a guide for further interference in case the patient rallies sufficiently.

In short, a laparotomy should be done in all cases of bladder rupture except those that come under Rule 4, or those of such severity that they cannot bear more than the median operation.

These rules designed for the furtherance of early operations are only intended to apply to cases seen in the early stages. After the first few days, if the patient survives, other indications may arise to guide the operator. The urine effused may be seeking the surface at some point, and the surgeon's duty is then to open the urinary abscess, and to provide drainage for it and for the bladder.

Rule 1 embodies the already established practice. If Rules 2 and 3 are accepted, they will encourage early operations in cases where, if exact indications were waited for, the operation would probably be done too late.

Lastly, comes the question of where to make the incision, and how to place the tubes for the best drainage of effusions in different parts of the pelvis. If the effusion is in front of the neck of the bladder, and the opening has been made into it by the suprapubic incision without opening the peritoneum, the bottom of the effusion should be sought with the finger, and a drainage-tube carried down to it.

In opening the bladder for drainage in such a case it may be worth while, if there is evidence that the effusion is making its way backward, to make the lateral perineal cystotomy rather than the median, because in the lateral incision the parts about the neck of the bladder are more freely opened, and if the urine finds its way in that direction, it is afforded a sufficient outlet. By the median operation, unless the in-

cision is carried back into the prostate, there is danger that the parts behind the triangular ligament will not be thoroughly laid open, and that any urine which found its way in that direction might not freely escape.

When, as so often happens, the effusion finds its way along the loose tissue on the side of the pelvis, and as in the case reported in this paper, up along the iliac vessels towards the renal region, perhaps no better incision can be chosen than that which is used for tying the common iliac vessels. In order to give the most direct drainage, and at the same time not to have any more pressure from the tube upon the iliac vessels than can be helped, the incision had better be made rather more towards the median line of the abdomen than is usually done for tying the iliac artery. In this way the tube goes down more directly, and does not make so sharp a bend where it dips into the pelvis over the vessels. If, however, the effusion has already reached up behind the peritoneum, above the brim of the pelvis, the incision must be made further out near the anterior superior spine of the ilium in order to give the best drainage. The finger introduced from this region can penetrate quite readily over the brim of the pelvis, and well down behind the bladder, while the peritoneum separates so easily that a considerable channel can be made, through which the sloughing connective tissue can afterwards discharge itself. Ordinarily, these anterior openings afford tolerably satisfactory drainage for pelvic abscesses, as the intra-abdominal pressure is sufficient to force out the pus even through an unfavorably placed opening.

In any case in which a suppurating cavity has formed in the bottom of the pelvis, which does not drain satisfactorily through an anterior opening, it is perfectly possible to reach it, and give it good drainage, by adopting the incision usually employed for excision of the rectum, and removing the coccyx and one side of the lower segment of the sacrum. Such a wound as this, which bears the name of Kraske, who uses it for excision of the rectum, gives thorough access to the lower part of the pelvis, and would give excellent dependent drainage in case of an abscess which was burrowing in that region, and which did not sufficiently discharge itself through the more anterior openings.





## A SUCCESSFUL CASE OF URETERO-LITHOTOMY FOR AN IMPACTED CALCULUS.

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THE following case is interesting, first from the fact that so small a calculus should lodge for so long a time in the ureter without progressing toward the bladder; secondly, on account of the serious constitutional disturbance that it caused; and lastly, from the success that attended its removal.

The patient, rather a slight man of forty, was under the care of Dr. S. W. Driver, of Cambridge, and was seen on the 22d of April, 1890, in consultation with him, and with Dr. J. T. G. Nichols and Dr. Walter Ela.

Six years before, he had been under the care of Dr. Driver for an inflammation of the bowels, which was mainly located in the right side, and was probably connected with the appendix. Since that time he had enjoyed good health with the exception of occasional attacks of colic, for which he sometimes consulted the doctor, and which seemed to be due to disturbances of digestion.

For the past three months his bowels had been somewhat loose, and during this time he had had seven or eight sharp attacks of pain which came suddenly and passed away suddenly, and were all referred to the left side, in front of the abdomen, at a point just above the middle of Poupart's ligament. This pain did not run down the thigh nor into the scrotum, although retraction of the testicle was noticed in some of the paroxysms.

None of these attacks were severe enough to demand medical aid until April 16th. On that day he was seized with a sharp, sudden pain, like that in the previous attacks, but much more severe, and enduring persistently, not passing off as the others had done. He was

then seen by Dr. Driver, who found him suffering from very severe paroxysmal pain. The abdomen was soft and flaccid, not tender, except slightly in the left hypogastrium, at the point where the pain was especially felt. Subsequently, a very sensitive spot was found in the back, midway between the crest of the ilium and the lower rib. This last spot of tenderness was constant, not disappearing during the intermissions, and the pain on pressure was very acute.

He was treated with full doses of opium, together with the frequent administration of ether when the paroxysms were especially severe. In this way he passed five days, suffering pain most of the time, though with occasional intermissions of considerable length.

Examination of his urine showed it to contain a few hyaline and granular casts, and on April 20th considerable pus was found in it.

On April 21st, he had for the first time some fever, the temperature going to about  $101^{\circ}$  F., and the pulse being above 100. Except for this he had a good day, with but little pain.

Early in the morning of April 22d an unusually sharp attack of pain began, and this lasted until we saw him, at one o'clock; the only relief obtainable being by the persistent inhalation of ether. The moment that he began to be conscious, the crying out from the pain was constant.

On this day he began to vomit, and his pulse was weak and frequent.

At the time of consultation the urine was perfectly clear. He was partially under the influence of ether when examined, so that his sensations could not be accurately determined, but it was quite evident that the point of extremest tenderness was in the lumbar region, midway between the ribs and pelvis. There was also a slightly increased sense of resistance felt over the renal region, but it was thought that this was very probably due to muscular rigidity.

Although there had been no movement of the bowels since the beginning of the attack, the absence of sensitiveness or distention in the abdomen made it pretty clear that the intestines were not responsible for the present illness. On the other hand, the character and location of the pain, with the tenderness in the lumbar region, pointed to the kidney as the probable source of trouble; and even in the absence of disturbance of micturition, and of the characteristic pain shooting into

the testicle, it was thought that a calculus in the ureter was probably the correct explanation of the symptoms. The varying condition of the urine, now containing pus and again clear, made it seem that a certain amount of urine leaked around the calculus, and the presence of casts in the urine showed that the kidney was already suffering from the obstruction.

In view of the rise of pulse and temperature, and the distinct and rapid loss of strength under the severe pain and the appearance of vomiting, it seemed wise to attempt to remedy the condition by an operation. The possibility that there might already be an inflammation, with pus forming around the site of the calculus, made the operation seem the more desirable.

The patient was accordingly etherized, and an incision was made along the outer edge of the quadratus lumborum muscle, from the lower edge of the twelfth rib to the crest of the ilium. The space between the rib and the pelvis was very narrow, even after the trunk was bent strongly over pillows.

The kidney was found to lie very high under the ribs so that only its extreme lower end could be brought into view. A needle carried through the kidney, in the direction of the pelvis, met with no resistance and encountered no calcareous matter. An exploration was then made along the course of the ureter, as nearly as that could be determined, and in the deep part of the wound about two inches below the kidney, a small hard mass was felt, and on examination it was found to be lying in the ureter. With a blunt hook the ureter was drawn forward into view, and exploration with a fine needle showed this mass to be a little calculus. It was readily removed through a little longitudinal cut in the line of the ureter.

A probe was then passed through this opening, up into the pelvis of the kidney, and downwards about five or six inches towards the bladder, without encountering any other calculi. A drainage-tube was laid in close contact with the opening in the ureter, and another was carried up behind the loose tissues around the kidney. The angles of the wound were brought together with sutures, but it was left largely open. The patient bore the operation well.

After recovering from the ether, the sharp paroxysmal pain had wholly disappeared, although there was still considerable dull pain in the same region as before.

The first urine after the operation was examined with the following result : Color, high; specific gravity, 1.019; sediment considerable, containing many large and small, hyaline and granular casts, a few pus cells, and occasional red blood cells. This specimen contained no albumen.

Two days later, on April 24th, the specific gravity was 1.023, and there was a large trace of albumen. The sediment still contained hyaline and granular casts, but far less abundantly. There were also still a few old blood cells, and very few pus cells.

On April 25th, the patient had a sharp attack of pain in the morning, which he located in the old place. This was relieved by the subcutaneous injection of morphine, and at the dressing, the tube which reached down to the ureter was shortened, with the idea that it might possibly be obstructing the flow of urine. The next day, the dressing, which had been dry since the day after the operation, was soaked with urine, and there had been no recurrence of pain. The patient was beginning to take food well, and was looking much better.

On May 2d there was another slight attack of pain, and this too was accompanied by the escape of urine through the wound. From this time the wound steadily closed, there was no more leakage of urine nor pain in the course of the ureter. The patient steadily gained in flesh and strength. Finally, on May 12th (three weeks from the time of operation), the last tube was removed, and the patient was up and out of bed.

The calculus removed in this case was a little rough phosphatic and carbonate stone weighing two grains.

A stone impacted in the ureter is a condition by no means devoid of danger. Cases are reported, in which, even although the other kidney was apparently healthy, a fatal suppression of urine has followed the stoppage of one ureter in this manner. Israel, who has reported such a case, regards the suppression as due to a reflex inhibitory action, the starting point of which is the irritation of the ureter by the calculus; and he cites cases to show how much the secretory function of the kidneys is under the control of the nervous system. Urethral surgery furnishes further illustrations of this sort of inhibitory action due to distant irritation, in the cases of interference with the function of the kidneys after operations, often of but little severity, on the urethra.



Besides this general danger of interference with the secretion of urine, the kidney on the affected side often becomes seriously diseased through changes directly due to the obstruction to the escape of urine. These changes may take the form of a hydronephrosis, or of an interstitial nephritis. The formation of a pyonephrosis under these circumstances too, is by no means uncommon.

That the kidney in the case reported had already begun to suffer, was shown by the presence of casts and pus in the urine. Unfortunately, no exact measure of the daily quantity of urine had been made, but it had been noticed to be diminished in amount, and this diminution was due, no doubt in part, to the obstruction of the calculus, and partly to the reflex irritation, and to the congestion of the kidney.

It would seem wise to operate for the removal of an impacted calculus as soon as any constitutional symptoms show themselves, or when there is evidence that the kidney on the affected side is beginning to suffer degenerative changes. An operation for the removal of a calculus, if done early, is much better borne than when done upon an exhausted patient, late in the progress of the disease. It may, too, save a useful kidney which would be lost by delay.

It is often difficult or impossible to determine beforehand the position of a calculus in the ureter. The point of greatest tenderness should be sought for with a good deal of care. In the case just reported, the stone was found directly under the point of constant tenderness in the loin. When the stone is lower down in the ureter, it is sometimes possible, particularly in a thin patient, to find a constant tender point where the calculus rests, by deep pressure over the line of the ureter through the anterior abdominal wall. In a woman, the calculus may be felt through the vagina, if it has lodged in the lower part of the canal. Such a case has recently been seen by the writer, where the calculus could be distinctly felt lying close to the left side of the cervix uteri, and a little behind it.

Israel proposes the following incision for exposing the ureter extra-peritoneally: Commencing at the anterior edge of the sacro-lumbar mass of muscles, a finger's breadth below the twelfth rib, the cut is to be carried parallel to the rib as far as its tip; then turning down towards the middle of Poupart's ligament till the line of usual incision for tying the iliac artery is reached, then turning towards the middle line, and

ending on the external border of the rectus muscle. According to the seat of the calculus, the incision will be made on the posterior, middle or anterior third of this line.

When, as is sometimes the case, the calculus is actually lodged in the vesical opening of the ureter, it may be reached by a supra-pubic incision in the case of a man, or by a dilatation of the urethra in the case of a woman. This lowest portion of the ureter is also quite accessible in woman through the vagina, and in the case above alluded to, in which the calculus could be felt alongside of the cervix uteri, it was removed by incision in the vault of the vagina, and was found to weigh 190 grains in the wet state just after its removal.

This case, which is not yet completed, will be reported more fully at some subsequent time.

The favorable course of the case which gave the title to this paper, shows that a longitudinal cut in the ureter will quickly close, just as similar incisions do in the urethra. No attempt to apply sutures to the wound in the ureter were made. The wall was so thin that a suture would necessarily have entered the canal where it would have been likely to give rise to the deposit of urinary salts, the calibre would have been narrowed by any gathering together of its walls, and the ureter lay so loosely in the tissues about that, unlike the urethra, it could not be drawn together by stitching the tissues down close to it, and lastly, it lay so deep that it would have been almost impossible to apply sutures without a much more extensive separation of the tissues about it.

## OBSERVATIONS UPON THE ANATOMY AND SURGERY OF THE URETER.

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THE observations which follow are the result of some investigations upon the anatomy of the ureter, made with reference to its surgical accessibility in different parts of its course. They were undertaken with the especial object of determining how best to reach and remove stones impacted in the ureter.

In the remarks which follow the writer takes it for granted that, if possible, it is always best to use an extra-peritoneal incision for the removal of a stone. The ureter is so thin-walled, especially when dilated by the retained pus and urine behind a stone, that if it is opened within the abdomen the closure of it by sutures must always be a doubtful and hazardous undertaking.

If animal sutures are used, the danger that they will be too soon absorbed is great, while silk sutures introduce the possibility of secondary stone-formation.

The writer has been able to find but one instance of a ureter sutured within the abdominal cavity (Cullingworth),<sup>1</sup> and in that case, although it was reported that there was no yielding of the wound in the ureter discoverable at the autopsy, still, as the patient died on the fourth day, it was rather too soon to say whether the sutures were going to hold or not.

The ureter, leaving the pelvis of the kidney by a funnel-shaped opening, runs downward on the anterior surface of the psoas muscle, crosses the common iliac artery and vein at the entrance of the pelvis, and then running in the recto-vesical fold of the peritoneum converges

<sup>1</sup> Trans. London Pathological Society.

toward the opposite ureter, and enters the posterior wall of the bladder. Here in the male it crosses the vas deferens. The opening through the wall of the bladder is more or less a valvular one, as the ureter, after penetrating the muscular coat, runs for some half to three-quarters of an inch between the muscular and mucous coats before it actually opens into the bladder. The opening into the bladder is somewhat smaller than the rest of the canal.

In the female the ureters pass around the neck of the uterus, which explains the reason that an increase in the size of the uterus causes a mechanical impediment often to the passage of the urine. As the ureters approach the pelvis in the lower part of their course through the abdomen, the left ureter lies close to the spine, and in the angle between the body of the vertebra and the psoas muscle. On the right the ureter is somewhat further separated from the spinal column by the interposition of the vena cava inferior. The vein and ureter lie in close apposition.

While this description<sup>1</sup> serves as a fairly reliable guide to the ureter in most parts of its course, still in a surgical search for the canal deep in the tissues—particularly if the subject be a fat one—it is extremely hard to find the lax tube, and to recognize it in its collapsed condition. Therefore anything which enables the surgeon to locate the ureter any more exactly may be of great aid in his search. There is a relation of the ureter to the peritoneum which I cannot find mentioned in any description of its anatomy, a knowledge of which will greatly simplify this search. This is the fact that the ureter is adherent to the peritoneum,<sup>2</sup> and always separates with the peritoneum as it is stripped up from the parts behind. The reason of this adhesion of the ureter to the peritoneum I sought by making microscopical sections across a ureter separated with its peritoneum and hardened in alcohol. A study of these sections showed that the ureter was bound to the under surface of the peritoneum by fibrous bands, which explains this intimate connection of the ureter with the membrane over it.

Further, an examination of a number of subjects leads me to believe that the relation of the ureter to that part of the peritoneum which

<sup>1</sup> Taken from Hyrtl.

<sup>2</sup> Twynam alludes to this adhesion of ureter to peritoneum.



becomes adherent to the spine is, within a slight range of variation, pretty constant, the ureter lying just outside the line of adhesion. So that if the surgeon has stripped up the peritoneum, and come down to that point where it refuses to strip readily from the spinal column, he will find the ureter upon the stripped up peritoneum at a short distance outside of this point. On the left side the distance from the adherent point to the ureter is from one-half an inch to an inch, while on the right side it is somewhat greater, owing to the ureter being displaced to the outside by the interposition of the vena cava between it and the spine.

After the ureter dips down into the pelvis it is less easily located, because it does not bear any fixed relation with a bony landmark, but fortunately in the cases in which a stone is sought in it, we have a hard body that is readily palpable to guide us to it.

To reach the ureter in the upper part of its course, perhaps no better incision can be chosen than that planned by Israel.

He draws a line from a point on the anterior edge of the sacro-lumbar mass of muscles, a finger's breadth below the twelfth rib, parallel to the rib as far as its tip; then turning down toward the middle of Poupart's ligament till the line of usual incision for tying the iliac artery is reached; then again turning toward the middle line, and ending on the external border of the rectus muscle. According to the seat of the calculus, the incision will be made on the posterior, middle, or anterior third of this line.

This incision gives us access to the ureter in the abdominal part of its course, and in the upper part of the pelvis. In a very thin subject with lax abdominal walls, or in a child,<sup>1</sup> it might even be possible to reach it down to within an inch or two of its entrance into the bladder; but even if reached, it would be difficult to operate upon it at such a depth.

Practically, in adults the lower three or four inches of the ureter cannot be reached from in front by an extra-peritoneal incision.

Unfortunately it is just in this lower part of the ureter that stones are likely to lodge. As the ureter is narrower just where it enters

<sup>1</sup> Twynnam removed a stone from the ureter about two inches from the bladder in a child, by an incision as for tying the iliac artery.

the bladder, the stone is often arrested there, and may remain fixed for a long time.

The plan suggested hitherto for the removal of stones impacted close to the entrance into the bladder has been to approach them through the bladder, by a supra-pubic incision in the male, and by dilatation of the urethra in the female.

If the stone is already projecting well into the vesical cavity, or has actually passed through the muscular coat and is lying under the mucous membrane, it may be removed easily and successfully through the bladder, and this would certainly be the method of choice. When, however, the stone has not reached the bladder cavity, and an incision of the bladder-wall is therefore necessary to uncover it, this operation is a dangerous one, as urinary infiltration about the base of the bladder is likely to follow it. It would be better then to reach the stone in the vesical end of the ureter by an incision from the outside, which would open a way for the escape of any urine that was afterwards extravasated.

As has been said, this part of the ureter cannot be reached from above, and it is necessary, therefore, to seek some approach to it from below. It occurred to me that a modification of the incision employed by Kraske for excision of the rectum would afford the desired access to this lower portion of the ureter, and dissections have confirmed me in this belief.

I find that an incision along the border of the sacrum, on the side upon which it is wished to reach the ureter, stopping just below the point of the coccyx, with a division of the sacro-iliac ligaments and the removal of the coccyx and the lower part of that side of the sacrum, lays open the pelvic cavity in a most satisfactory way, and gives easy access to the lower three or four inches of the ureter. The only difficulty in this dissection is in finding the ureter, which in its collapsed state cannot be easily made out.

The converging lines which the ureters pursue through the pelvis lie pretty closely over the lateral edges of the sacrum, and this relation will help somewhat in fixing their location when approaching them from behind. The peritoneum is very thin, and there is considerable danger of wounding it during a protracted search. Of course, with a stone in the ureter to guide us, this difficulty would largely disappear.

The danger of wounding the rectum may be avoided by introducing into it a large sound, with which its cavity may be mapped out, and which can be used afterward to draw it to one side.

For a stone impacted in the male this would seem a very ready and safe incision for reaching this portion of the ureter. The space afforded is ample for a careful inspection of the parts, and the opening, being dependent, affords good drainage.

In the female we have even readier access to this part of the ureter through the vagina. The ureter for the last two, or even in some cases three, inches of its course runs in the broad ligament in close relation to the upper part of the vault of the vagina, where it can be reached and incised without danger of opening the peritoneum.

That so much of the lower end of the ureter lies within the broad ligament, and is accessible from the vagina, does not seem to be generally understood.

Emmet describes a case in which the stone projected into the bladder enough to give a click when the steel sound passed over it, and in which he cut down upon it from the vagina. He says: "As soon as I reached the stone, I enlarged the opening forward, toward the neck of the bladder, this being the only safe direction to avoid entering the peritoneal cavity.

From my dissections it would seem that, even had the stone lain an inch, or an inch and a half, higher up in the ureter, it might still have been reached from the vagina without danger of wounding the peritoneum.

The incision for reaching a stone lying above the vault of the vagina should be outward and backward, in order to keep it within the layers of the broad ligament. After the vaginal wall is divided, the finger pushes up readily into the broad ligament, and the tissues can be pressed aside until the stone is reached.

If then the incision is made through the ureter on its under side, the danger of injuring the peritoneum must be slight. In case it happened that a stone was so lodged in the ureter of a female as to be out of reach from the vagina, and yet not high enough to be accessible from above, the incision over the sacrum might be required for its removal.

That the removal of a stone above the vault of the vagina is feasible by vaginal incision, the following case will show:

The patient was a rather stout woman of thirty-nine years of age, and was seen first by me, with Dr. Joseph Williams of Charlestown, May 15, 1890. She had for fifteen or sixteen years been subject to attacks of renal colic, always on the left side, and almost always followed by the passage of stones.

The last severe attack was in December, 1888, but since that time she had had a number of slight attacks during which she had passed twenty or more small stones. The attack in which I saw her began five or six weeks before my visit, and had continued ever since, with pain of varying intensity.

The urine was at times much diminished in quantity, and for several days before I saw her had been very scanty (from four to six ounces a day). It had, during this time, been loaded with urates. On the day that I saw her it had become more abundant and less thick.

The patient had a good appearance, with moist tongue, quiet and steady pulse, and normal temperature. She was perspiring rather freely.

The pain in the region of the left kidney, and running down toward the bladder, was intermittent and spasmodic in character.

In the left lumbar region was a distinct tumor about as large as two fists, which was sensitive to pressure. There was also a point of tenderness deep in the left side of the pelvis. By vaginal examination, a little hard mass was found in the left broad ligament close to the cervix uteri. This felt about as large as the last joint of the forefinger, and it was very sensitive to pressure. The palpation of it during the examination started a spasmodic pain in the left side that had a bearing-down or expulsive character.

A sound introduced into the bladder could be carried to within about three-quarters of an inch of this little, hard mass, but could not be brought in contact with it by the most careful bimanual manipulation.

On July 1st, I saw her again, and the calculus could be felt in exactly the same place where it had been detected by the examination in May.

On July 4th the patient was etherized for operation. An incision was made over the calculus through the vault of the vagina just to the left of the cervix uteri. The calculus was easily reached, the grating of the knife upon it being distinctly felt during the first incision.

After the end which presented had been thoroughly uncovered, it was found that the rest of the calculus was so tightly grasped by the tissues above that it could not be easily extracted. In fact, the presenting end broke to pieces under the grasp of the forceps with which extraction was being attempted. After trying many manipulations in vain, a blunt hook was passed up alongside of the calculus into the ureter behind, then turned and hooked over the upper end, and traction with this, aided with the finger pressing the tissues aside, finally accomplished the removal of the stone.

The moment it came out there was a rush of pus from above. This pus was of ordinary thickness, apparently not much thinned by urine. Probably from ten to twelve ounces escaped. A rubber tube was introduced into the ureter through the opening made. After the pus had fully escaped, the tumor in the abdomen was found to have disappeared. The patient made a



good recovery, and the urine, which was very scanty just after the operation, gradually increased in quantity until it became sufficiently abundant. Drainage through the fistula was kept up for some time, and finally, when the drainage-tube was removed, there seemed to be no tendency for the opening to close, there being a constant, moderate discharge of pus through it. She recovered strength slowly, as is usual in those cases where the kidneys are seriously involved. She left the hospital on the 25th of July. She continued to gain strength after getting home, and finally was able to be about as usual, doing her ordinary work.

This patient was last heard from in November, 1890, and at that time there was still an opening in the vagina, discharging a small amount of pus. No urine ever came through the fistula, showing that the long dissection of the kidney during the complete stoppage of the ureter had sufficiently destroyed the cortex to stop excretion. If at any time the escape of pus into the vagina becomes a serious annoyance, it can be stopped by the removal of what remains of the kidney.

The stone that was removed weighed one hundred and ninety grains. It was elongated, and evidently made up of two stones which had become attached together, as there were two nuclei, one at each end of it.

I have endeavored in this brief communication to point out the ways in which the ureter can be safely cut down upon in different parts of its course for the purpose of removing calculi impacted in it; and my dissections have led me to think that by a properly selected operation a stone can be removed from any part of this canal by an extra-peritoneal incision.

In order now to select the proper incision for each case, it is necessary to be able to locate the stone exactly, and this is often a matter of great difficulty.

A rectal or vaginal examination will ordinarily reach a stone of any size impacted in the lower end of the ureter, but throughout the rest of its course this canal lies so deeply that palpation of it is very unsatisfactory.

Occasionally, the position of the stone may be suspected if in the presence of symptoms pointing to an obstruction of the ureter there is a constant spot of great tenderness somewhere in the course of the canal. The writer in one instance cut down over such a painful spot in the loin, and successfully removed a stone.

When indications do not, however, point with sufficient directness to one spot, more exact information must be sought, and within the past eighteen months two operators,<sup>1</sup> seeking a solution of this question,

<sup>1</sup> Hall. New York Medical Record, October 18, 1890. Arbutnot Lane. Lancet, November 8, 1890.

have made use of an opening into the abdomen, and palpation of the ureter through that opening with brilliant results.

In both of these cases the stones, though small, were readily felt through the abdominal incision; and after an opening had been made in the lumbar region, the hand in the abdomen greatly aided in the removal of the calculus — in one case by steadying it and guiding the instruments to it, and in the other case by actually lifting the calculus out of the pelvis to a point where it could be easily reached above the crest of the ilium.

This last case suggests that it might be possible by manipulations through an abdominal incision to work a calculus back along the ureter from deep in the pelvis to a point where it could be reached from the loin, and thus to avoid the necessity of the more severe sacral wound.

It may also occasionally happen that a friable calculus can be crumbled between the fingers without injury to the ureter, and thus reduced to sand, which will pass along the canal into the bladder.

Whether it would ever be wise to employ a needle to break up a calculus in the ureter, as Mr. Thornton has done with calculi in the biliary ducts, seems to me very doubtful. The urine is a thin fluid as compared with the bile, and there would, therefore, be more danger of its escaping even through the minute punctures of a needle.

Lastly in regard to the proper treatment of the ureter after the removal of the calculus.

Mr. Arbuthnot Lane closed the wound in the ureter by a continuous silk suture, and had no leakage from it; Mr. Twynam also sutured the ureteral wound, but had considerable leakage from it, and the silk gave rise to some suppuration.

In the cases reported by Dr. Ralfe and Mr. Godlee, and by the writer, in which longitudinal incisions were made in the ureter, the slight leakage of urine and the rapid healing of the wounds would seem to show that suturing the wound was an unnecessary prolonging of the operation.

Furthermore, owing to the thin wall of the ureter, it must be a matter of great difficulty to prevent the stitches from entering the calibre of the tube, and if they do so, they are likely to serve as nuclei for fresh stones.

It would seem, therefore, best not to suture the canal, but to provide adequate drainage for the urine escaping from it until the wound in its wall closes.

In the female the lowermost part of the ureter is in intimate relation with the vaginal wall, and it is possible here to get sufficient thickness for the easy application of sutures without encroaching on the cavity of the tube. Emmet thus closed the wound in his case with fortunate result.

In 1889 M. Le Dentu, in his large work,<sup>1</sup> wrote: "The portion of the canal between the entrance and the floor of the pelvis must, for the present, be regarded as inaccessible."<sup>2</sup>

I trust that the considerations that I have offered will show that this is no longer the case.

The following appendix gives a brief account of the important surgical features of all of the more recent cases that the author has been able to find in which calculi have been removed from the ureter. Their almost uniform success, while suggesting the possibility that the less favorable cases have not yet found their way into print, shows, at least, that much may be accomplished in this branch of surgery.

Dr. T. A. Emmet has met with three cases<sup>3</sup> in which a stone was impacted in the lower end of the ureter. In two of these cases he operated: once by opening the bladder, and then with a curette removing the stone from the mouth of the ureter. In the other case he always felt the click of the stone on the sound in the same place. Suspecting that the stone was in the ureter, he made slight backward pressure with a large sound in the bladder and was then able to feel it with his finger in either the vagina or rectum.

With the patient on the side he operated by an incision through the vaginal wall, while an assistant kept the parts prominent by pressing backward and upward with a sound in the bladder. The stone was removed without having entered the bladder or peritoneal cavity. The weight of this stone was 98 grains.

<sup>1</sup> Affections Chirurgicales des Reins, des Ureteres, et des Capsules Surrenales.

<sup>2</sup> "La portion du conduit intermediaire au detroit superieur, et au plancher du bassin doit seule jusqu'à nouvel ordre être considérée comme inaccessible."

<sup>3</sup> Principles and Practice of Gynecology, 1884, Page 796.

Dr. Cullingworth reported a case<sup>1</sup> in which there were calculi in both ureters.

The patient was a woman of thirty years. The symptoms referring to the kidneys (attacks of pain in back and sides) dated back ten months.

When seen she had fever, pain in loins, frequent micturition. The urine contained much pus.

Examination showed a smooth, lobulated tumor in the right side of abdomen. *Per vaginam*, there was detected a mass of stony hardness, about the size of a walnut, to the right of the uterus, and a smaller and equally hard lump to the left.

The diagnosis made was pyonephrosis, with probably independent disease of the ovaries.

An abdominal incision was made, and a stone was found impacted in the right ureter, with great distention of the ureter and pelvis of the kidney above.

This was removed by an incision directly into the ureter, and much pus and urine escaped through the abdominal cavity. The stone weighed 270 grains. The edges of the incision in the ureter were brought together by means of five interrupted sutures of fine carbolized silk. Drainage of the abdomen was provided by a glass tube.

The patient lived four days, the urine varying in amount from 15½ to 24½ ounces in the twenty-four hours.

At the autopsy the abdomen contained about 5 fluid ounces of thin, dirty fluid. Both kidneys were enlarged and contained abscesses. The stitches in the ureter had not given way, and there was no evidence of leakage.

It was found that the hard mass felt to the left of the uterus was another calculus in the left ureter, which, though longer than the stone taken from the right side, did not block the passage so completely.

It seems possible from this account that, had the hard masses felt through the vagina been recognized as stones in the ureters, they might have been removed by incision through the vault of the vagina, without entering the abdominal cavity.

Dr. J. M. Richmond reports the case<sup>2</sup> of a woman of forty-two

<sup>1</sup> Transactions of the London Pathological Society, vol. xxxvi, p. 278.

<sup>2</sup> Transactions of the Medical Association of Missouri, St. Louis, 1888.



years, in whom he detected a stone in the bladder end of the ureter covered only by mucous membrane.

He dilated the urethra and dislodged it with the finger and a tenaculum.

Dr. Ralfe and Mr. Godlee.<sup>1</sup> Case of a woman aged twenty-six, who was attacked with nephritic colic on both sides during the same day. The pain in the right side passed off quickly, but on the left side it persisted.

She was seen eight days later, and at that time had had suppression for fifty-three hours.

The left kidney was exposed by lumbar opening and incised, but no stone found in it. Exploration with the finger detected a stone about two inches below the kidney. The ureter was drawn up, opened longitudinally, and the stone removed.

There was an immediate relief of symptoms, and large quantities of urine passed by the wound.

During convalescence from this operation there were several slight attacks of right renal colic, so after the wound was healed, the right kidney was exposed and incised, but only a little mass of gravel was found in it, and no stone in the ureter down to the point where it crossed the iliac vessels. Subsequently there were several slight attacks of pain, and some gravel, and a small stone was passed *per urethram*. The patient made a good recovery.

Twynam.<sup>2</sup> This was the case of a boy aged eight, well grown. He suffered from pain in the bowels and hæmaturia. This was intermittent. The symptoms seemed to point to the left kidney as the seat of trouble.

Langenbuch's incision was made on the left side. Nothing was found in that kidney, but a small, hard calculus was detected in the right ureter just below the brim of the pelvis. Nothing further was done at the time, and with the exception of one long and serious convulsion, the child made a good recovery.

At the end of three weeks the stone was removed through an extraperitoneal incision in the right hypogastrium. There was difficulty in

<sup>1</sup> Transactions of Clinical Society, London, February 22, 1899.

<sup>2</sup> *Ibid.*, 1890, xxiii.

reaching the stone, but with the aid of an assistant pressing it up, the ureter was incised over it, and it was removed.

The wound in the ureter was sutured with silk, the ends of which were brought out through a drainage-tube. The closure, however, was not complete, and the dressings were soaked with urine.

On the fifth day the urine ceased to come through the wound. The silk kept up some suppuration for a time, but after this was removed the wound quickly closed.

Cabot.<sup>1</sup> This was a case of calculus impacted about two inches below the kidney in a man aged forty. The stone had been fixed in that position for a week, and had caused extreme suffering, with considerable diminution in the amount of urine.

He was seen and operated upon April 22, 1890. The ureter was exposed by an incision along the edge of the quadratus lumborum muscle. A little stone was felt in it about two inches below the kidney at a point where excessive tenderness had existed during the whole of the attack. It was drawn forward into the wound, and removed by a little longitudinal incision in the ureter. No sutures were applied. There was slight leakage of urine through the wound up to the tenth day, but after that time it ceased. The tube was removed three weeks after the operation, and the patient rapidly recovered; the operation being followed by complete relief.

Hall<sup>2</sup> reports the case of a woman of thirty-six years who had been troubled with paroxysmal attacks of abdominal pain of obscure origin for five years. Suspecting a calculus in the kidney or ureter, Dr. Hall opened the abdomen, and found the pelvis of the kidney and upper part of the ureter dilated, with a calculus impacted below in the ureter.

The patient was turned on the side, and an opening was made into the kidney through a lumbar incision. The left hand in the abdomen assisted in directing the efforts towards the dislodgment of the stone.

Recovery was complete, the wounds being closed on the twenty-first day.

Lane<sup>3</sup> records the case of a woman twenty-three years of age, who

<sup>1</sup> Boston Medical and Surgical Journal, September 11, 1890; also p. 23 of this pamphlet.

<sup>2</sup> New York Medical Record, October 18, 1890.

<sup>3</sup> London Lancet, November 8, 1890.

had been troubled intermittently with attacks of pain in the abdomen since she was three years old.

Shortly before coming under observation she had had more frequent and violent attacks than ever before, coming on two or three times a week.

After each attack the urine contained an excess of pus.

The left kidney was explored by a lumbar incision, and the pelvis was found much dilated; but nothing could be found to explain this beyond a fold across the top of the ureter, which prevented the finger from entering it.

With the finger in the lumbar wound, and afterward in the rectum and vagina, the ureter was examined, except for a short distance in the middle of its course, where it could not be reached from either direction. Nothing could be felt.

The patient recovered well, but the pain, which was at first relieved, soon returned.

In July, 1890, having recruited her strength, she returned for another operation.

The abdomen was opened along the left linea semilunaris, and a stone was easily felt in that middle part of the ureter that had not been explored in the previous operation. With the hand in the abdomen, the stone was pressed upward to the crest of the ilium, and through a small incision in the side the ureter was exposed and the stone removed.

The opening in the ureter was closed with a fine continuous silk suture, and the wound quickly closed without any urine leakage.

Cabot.<sup>1</sup> This case is reported in the body of the paper.

<sup>1</sup> Boston Medical and Surgical Journal, December 25, 1890.





## A CASE OF CYSTITIS, WITH THE FORMATION OF A THICK EPIDERMAL SHEET IN THE BLAD- DER—PACHYDERMIA VESICÆ.

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THE following case was reported before the American Association of Andrology and Syphilology, at their fourth annual meeting, in the hope that some member of the Association could put the writer on the track of the report of similar cases. None of those present had seen or known of such cases, except Dr. J. A. Fordyce, of New York. He brought to the meeting micro-photographs obtained from sections



FIG. 1. Pachydermia vesicæ (sclerosis en plaques). From a micro-photograph by Dr. J. A. Fordyce.

The epidermal sheet, breaking up into scales in its outer part, is well shown.

of the bladder and ureter of a patient that he had seen on the autopsy table in Vienna, but of which he could give no clinical history. The condition shown in these photographs was exactly similar to that found in the case which forms the text for this paper, and one of them has been accordingly reproduced here (see Fig. 1).

Dr. Fordyce also called the writer's attention to an article by Posner in Virchow's *Archiv*, upon "Dermoid Changes in Mucous Membranes," and it is to this article and other German investigations referred to by Posner, that this paper is indebted for the pathological consideration of the subject.

The following is the clinical history of the case:

The patient, James E. B., was a strong-looking man aged forty years. In 1870 he was cut for stone by the lateral perineal method. The wound healed in about three weeks, leaving no fistulous track. Always after this time urination was more frequent than normal. Five years ago, he had an attack of acute cystitis, accompanied by much pain; and from that attack the bladder never wholly recovered, giving him at times much trouble, but never, until the present illness, compelling him to stop work.

In the middle of June, 1889, when feeling quite well, he had a sudden stoppage of water. For this he saw a doctor, who passed an instrument into the bladder, with some relief of his symptoms; and, shortly after, he passed a small phosphatic stone. He had severe pain for a week, and this continued, though somewhat less in degree, up to the time that he was seen by the writer, on August 2, 1889. The pain was felt just before, during, and after passing water, and lasted for about a minute after the act of urination was finished. Occasionally a few drops of blood came in the last part of the stream. The urine was loaded with mucus and pus, and contained many pavement epithelial cells, both singly and in clumps; it was usually colored somewhat by the presence of blood; it passed in a fairly good stream.

An examination with a sound at this time did not find a stone, but showed a slight narrowing in the deep urethra, at the site of the old operation. There being but little improvement under treatment, he was sent to the Massachusetts General Hospital for a more thorough investigation under ether.

In this examination the sound failed to touch a stone or any calcareous matter, but, after the exploration, a washing with the Bigelow evacuator brought away several small papillomatous-looking masses. These bits were examined by Dr. W. F. Whitney, who reported that they were composed of papillary masses of epithelial cells mixed with lime salts; and, though they did not have the branched forms common in papillary growths in the bladder, it seemed probable that they came from a papillomatous tumor.

It was, therefore, decided to do a suprapubic cystotomy to remove the growth; and this operation was done on September 5, 1889. The Garson-Peterson method was followed. The bladder held seven ounces of boracic solution, and the rectal bag was distended with about fourteen ounces.

On opening the bladder, the posterior wall was seen to be of a whitish-yellow color, and to the finger it felt stiff, and was rough on the surface. The rest of the bladder-wall was normal in appearance. It was presently found that a thick membrane could be detached from the diseased surface, and, with care, could be peeled off with the fingers in sheets of one or two square inch area. It was loosely attached, and after removal left a smooth surface, which bled but slightly. The wall of the bladder which it left felt soft and supple.

This membrane having been removed as thoroughly as possible, the bladder was drained by a double rubber tube carried to the bottom of the cavity, and antiseptic dressing was applied.

The operation was followed by very little fever or discomfort, and the wound did uninterceptedly well. On the fourth day one tube was removed and a catheter was tied in through the urethra. On the ninth day the remaining tube was taken out, and the wound rapidly closed; so that, on the eighteenth day, the catheter was finally left out, and the patient passed water by natural efforts.

Urination was now quite frequent, and the urine showed a large trace of albumin and contained considerableropy pus with an admixture of blood. This condition of the urine improved quite rapidly under the daily injection of a solution of nitrate of silver, one grain to three ounces, and, at the same time, the capacity of the bladder steadily increased.

The patient finally left the hospital on October 31st, at which time he could hold his water for from one and a half to two hours, the bladder having a capacity of about four ounces. There was still quite a large amount of sediment in the water, which consisted chiefly of mucus, but which for some days had begun to contain a number of epithelial flakes similar to those noticed before the operation.

After leaving the hospital, he continued the bladder irrigation, using a boracic solution twice a day; and every second day, in addition to this, he injected the bladder with a solution of nitrate of silver, two grains to the ounce, taking care afterward that this wholly escaped.

Under this treatment, supplemented by the occasional passage of sounds to keep the deep urethra properly dilated, he slowly improved, gaining both in power of holding water and in general condition. During the winter he took turpentine for a time, which cleared the urine somewhat; and, later, under the moderate use of sandal oil, the improvement was still more marked.

In May, 1889, he was finally able to resume hard work. He then weighed as much as he ever did. The urine still contained considerable sediment, but it was of a light flocculent character and there was no appearance of blood. There were whitish clumps of epithelium in it, but these were lighter in texture and not so large as the solid white masses that it formerly contained.

A thorough rectal examination was made at this time, but nothing abnormal could be detected about the posterior bladder-wall.

In August, 1890, he continued well, and the urine no longer contained any of the epithelial flakes or clumps. It was still somewhat cloudy from a slight admixture of mucus.

The membrane removed at the operation covered an area of about forty-five square centimetres, and when fresh was from two to three millimetres in thickness, varying within these limits in different parts.

Fig. 2 shows very well the microscopical appearance of a cross-section of this membrane. It is composed of epithelial cells, which are arranged much as they are on the surface of the skin.

In the deeper parts they are penetrated by papillae of connective tissue, and the cells are square or rounded, while, as the free surface is approached, the cells become flattened like ordinary epidermal cells, and on the surface they are being exfoliated in ragged flakes. In places, near the surface, there are well-marked onion bodies, or epidermal pearls; but at no part are these to be found in the lower layers of the epithelium.



FIG. 2. Cross section of membrane.



There is, in the lower part of the horny epithelium, a well-defined stratum of cells containing keratohyalin — which is a proof, if any were needed, that these are true dermoid cells.

At no place is there any apparent tendency of the epithelial elements to burrow down into the connective tissue beneath, after the manner of a cancer.

The mucous membrane of the bladder is normally covered by several layers of epithelial cells, which in the deep parts are more or less rounded, and on the surface are flattened. Krause and Oberdieck<sup>1</sup> describe four layers of epithelium; and the latter has determined the thickness of the epithelial portion of the mucous membrane to vary between 0.036 and 0.068 millimetre in the empty bladder, and to be about one-half to one-third as thick in the full bladder.

The epithelial layer forms a flat sheet on the connective tissue beneath, and has no papillary arrangement such as exists in the deep layers of the skin.

The membrane in the case reported, which was made up entirely of epithelium, was therefore from fifty to one hundred times as thick as the epithelial layer normally existing on the bladder-wall, and its nourishment was provided for by papillæ thrown up by the connective tissue below.

These papillæ are entirely unusual in this locality, yet they nowhere showed any tendency to go beyond limits of growth that are physiological in other parts of the body. There was at no point any formation of extremely long, branched papillæ, such as are seen in papillary growths of the bladder. In short, the condition resembled the hyperplasia that are met, not uncommonly, on other epithelial surfaces as the result of long acting irritations. On the skin we have corns and callosities, due to a pathological process almost exactly identical. There is, however, this difference, that whereas in the skin we have a simple hypertrophy of the horny layer which is normally present on that surface, we here have the formation of a highly-developed horny layer on a surface on which true epidermal cells do not normally exist.

Virchow<sup>2</sup> has described a similar condition of the mucous membrane of the larynx, which he has named "*pachydermia laryngis*." He has

<sup>1</sup> Ueber Epithel u. Drusen der Harnblase, etc. Göttingen, 1884.

<sup>2</sup> Berl. klin. Wochenschrift, August, 1887.

shown that, when the mucous membrane of the larynx is exposed to persistent irritation, the epithelium may become much thickened into many layers and cornified, while papillae are thrown up out of the connective tissue below. This change he noticed only on those parts of the larynx where the epithelium is of the pavement variety. And he regards those parts of the laryngeal mucous membrane which normally have pavement epithelium, as allied to the outer skin, and therefore subject to changes and pathological processes such as are met with on the skin, while the portions of the larynx which are covered with ciliated epithelium — *i. e.*, the more properly mucous surfaces — he thinks, are not subject to these changes.

Posner<sup>1</sup> points out, however, that the kind of cell on a given surface is not a reliable guide in determining the relation of that surface to others which seem to resemble or to be allied to it. Thus the nasal cavities, which are infoldings of the ektodermal layer, and are, therefore, allied to the outer skin, are covered with ciliated epithelium and are plentifully supplied with mucous glands — in short, are covered by a true mucous membrane.

Posner, therefore, divides the question of the cornification of mucous membrane into two parts: (1) Can mucous surfaces covered with cylindrical cells undergo dermoid changes? And (2) Can surfaces of a meso- or ento-dermal origin take on a dermoid character?

The first of these questions he answers easily in the affirmative, and brings forward in proof many observations showing the change of cylindrical epithelium into dermoid cells.

The second question is, however, the one that particularly interests us in connection with our case; for the bladder, being derived in the embryo from the sinus urogenitalis, is distinctly of entodermal origin, and has no close relationship, therefore, with the external skin.

In the consideration of this question Posner points out the frequent occurrence of the dermoid change on the mucous membrane of the upper portion of the vagina in cases of prolapse. Similar changes are also observed in the uterus, in the larynx, and in the male urethra. It is to be remembered, however, that the anterior portion of the urethra — *i. e.*, all of the canal anterior to the constrictor urethræ

<sup>1</sup> Virchow's Archiv., vol. cxviii., 1889.

muscle — is of *ektodermal* origin, being formed by an infolding of the outer epithelial layer, so that only when dermoid changes are found in the deep urethra can they be regarded as occurring on mucous membranes of *entodermal* origin.

When we come to the bladder we find instances of dermoid changes extremely few and doubtful. v. Antal has reported a case of epithelioma of the bladder in which all the histological characteristics of the outer skin were observed. Even the kerato-hyalin layer was there. Posner justly says, however, that great care is necessary in such cases, to be sure that the tumor is primary on the mucous membrane. He also quotes a case of Marchand's<sup>1</sup> to show to what extent the epithelium of the skin may grow over onto the mucous membrane of the bladder. In this case, a boy with a perineal fistula following lithotomy had the bladder, the ureters, and the pelves and calices of the kidneys covered with a lining of horny epithelium which had grown in from the skin.

These are the only instances that Posner has been able to find of epidermal changes of the mucous membrane of the bladder. He considers neither of them as clear examples of a change (*umwandlung*) of the vesical mucosa into epidermis, but rather as instances of transplantation or of direct growth of epidermis onto the bladder by continuity of tissue.

Whether the case presented with this paper can be accepted as an undoubted instance of the bladder mucous membrane undergoing an epidermal change must be decided by the consensus of opinion of those best able to judge.

The fact that the patient had a lithotomy many years before, introduces the doubt whether here we have not a case of the growth of the epidermis of the skin over onto the mucosa of the bladder. It is to be remembered, however, that the perineal wound was open for only three weeks, that it then healed solidly and smoothly, and that there is now no dipping in of the skin, such as are seen in cases of old fistulae.

It seems to the writer that this rapidity of healing precluded the possibility of any continuity of growth of epithelium between the skin and bladder, such as occurred in Marchand's case.

<sup>1</sup> Naturforscher Versammlung zu Wiesbaden.

Furthermore, the clinical history of this case seems to throw some light on the etiology of the affection. After the operation the clumps of epithelium exfoliated from the dermoid surface reappeared in the urine, persisted, though in diminishing amount, for more than six months, and only finally disappeared after about ten months. This would seem to show that the dermoid condition continued over portions of the bladder-wall, and was finally so modified by treatment that all evidences of it vanished.

The nitrate of silver injections were not of a strength to destroy epidermal tissues, and no other part of the treatment could be supposed to have any power to effect the destruction of this membrane.

All of the treatment was directed against the cystitis, and the disappearance of the dermoid flakes coincidently with the mitigation of the inflammation in the bladder would suggest that the dermoid condition was induced by the irritation of the cystitis, and disappeared *pari passu* with the cessation of this irritation.

Virchow has shown that *pachydermia laryngis* has resulted from not unsimilar irritations of the mucous membrane of the larynx, and the writer is inclined to the view that in his case the dermoid change in the bladder was the result of the chronic cystitis.

In making a diagnosis of this condition in future cases the points to be taken into consideration are the chronic character and obstinacy of the cystitis, and the presence in the urine of flakes and clumps of horny epithelial cells.

It seems quite possible that a *pachydermia vesicæ* exists not infrequently in a less degree than in the case reported and goes unrecognized. The appearance in the urine of considerable numbers of flakes of epithelium is not uncommon in the course of severe cystitis, and that the dermoid condition should not be recognized on the autopsy table may well be due to the maceration which the epithelium rapidly undergoes after death. This is so great that in order to obtain correct ideas of the condition of the epithelium in a normal bladder it has been necessary to inject the bladder immediately after death with absolute alcohol to fix the cells and prevent their separation. The present more frequent performance of suprapubic cystotomy will probably give us opportunities to recognize this dermoid change during life.

With the cystoscope the whitish color of the surface might perhaps



be appreciated, and in places where the edge of the membrane was sharply defined, characteristic pictures might be obtained. It would probably, however, be very difficult to distinguish this condition from some of the yellow surfaces furnished by tuberculous ulcerations of the bladder.

As far as we can judge from this one case, the treatment of a similar condition should be directed to the allaying of the inflammation. Certainly the injections of nitrate of silver seemed to answer an excellent purpose. And every measure that allayed the irritation and enabled the patient to carry his water longer and to urinate with less pain was followed by a corresponding diminution in the amount of pus in the water and in the number of epithelial flakes.

Dr. J. P. Bryson, of St. Louis, suggested the possible utility of injections of salicylic acid solution. He said that he had had excellent results from the use of these solutions in the treatment of cystitis, and he thought they would be peculiarly applicable in cases of this sort, for salicylic acid has the well-known power to remove warts, corns, and other growths of hyperplastic epithelium.

If milder methods of treatment fail, and resort to operation seems indicated, the suprapubic section affords the only satisfactory method of dealing with the membrane; for its separation and removal by the limited route through the perineum are manifestly impossible.



## A CASE OF CALCULOUS PYELITIS, WITH COMPLETE SUPPRESSION OF URINE FOR SEVEN DAYS; RELIEVED BY OPERATION.<sup>1</sup>

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IN cases of calculous pyelitis we may have suppression of urine brought about in several ways.

It may be induced by the presence and irritation of the calculi in the pelves of the kidneys, without any stoppage of the ureters. Kidneys which contain stones often undergo inflammatory changes which gradually disable them, and thus a diminution and final cessation of function may be brought about. Even when the pathological changes have not progressed very far, such kidneys may not be able to bear any extra work that is put upon them. In one calculous patient, I have seen immediate suppression follow an operation for appendicitis, with moderate peritonitis. The kidneys showed interstitial changes which were not considerable, and yet their power for work had been so diminished that they were overcome by the ether, and by the increased elimination required by the absorption of inflammatory products from the wound and from the peritoneum. Although the calices were occupied by many stones in this case, there was no obstruction to the flow of the urine.

The way, however, in which calculi more commonly cause suppression, is by obstructing, or occluding the ureters. The conditions under which this occurs, and the mechanism by which the suppression is induced may vary considerably, as follows:

- \* (1) Both ureters may be simultaneously obstructed.
- (2) One kidney having been previously destroyed or disabled, the ureter leading from the remaining kidney may be stopped.

<sup>1</sup> Read before the American Association of Genito-Urinary Surgeons.

(3) One ureter only being occluded, the irritation of the stone may by some inhibitory effect lead to a cessation of function in both kidneys.

There may be some doubt whether the case that I am about to report belongs in the first or second category. From the observations I was able to make, it seemed probable that the right kidney was more seriously affected than the left, that its ureter had been blocked for a longer time, and that finally it was the obstruction of the left ureter that caused the total suppression.

E. A. P., a strong man of sixty, was seen by me in consultation with Dr. G. K. Sabine of Brookline, Mass., on December 12, 1892.

His previous ailments had not made a great impression on him, and it was therefore difficult to be sure of his accuracy in his observation of his symptoms. His history was as follows:

He had always been subject to rheumatism. Seven years ago he had an attack of renal colic in the left kidney and passed two stones. He then was well until two years ago, when he had an attack of pain in the right side and passed a stone that was larger than the previous ones. The pain in this attack was thought to be due to rheumatism, and was not so severe as is usual in renal colic, so that its origin was not suspected until the stone was passed.

He was then free from trouble until November, 1892. Early in that month he had some twinges of pain in the right side, which were thought to be due to rheumatism. They passed off. Then a similar pain came in the left side on the 19th of November. He sent for Dr. Sabine on the following day. The pain in this attack was not severe, but was recognized as similar to that which he had had two years before, when he passed a stone. He gradually got better, and on December 5th he went to his business in town, but was seized while there with such an acute pain in the back that he went directly home again. This attack was so severe as to throw him into a profuse perspiration, and the pain was felt through the abdomen as well as in the back; and was distinctly referred to the left side.

On December 6th it was noticed that he was not passing any urine. The anuria continued through the 7th, 8th and 9th. On the latter day a catheter was passed, but only a drachm of turbid urine was obtained. From that time there was no water, up to the time that I saw him on the evening of December 12th.



At my examination he looked quiet and easy, not at all like a sick man; he had no nausea, no headache, no drowsiness,—in fact, he said he felt perfectly well. I made an examination, but could detect nothing, either in the abdominal or lumbar region. There was no tenderness anywhere, even to forcible pressure. I advised that he should take considerable water, should have a mustard poultice over the kidneys, and that sugar of milk should be administered freely through the night.

I saw him again the following day. He had passed no urine. Dr. Sabine thought he was a little more dull. His tongue was very dry, but he had no pain, except that occasioned by a slight flatulence. His pulse was 76 and of fair strength. He said that he had some relish for food, and no nausea. I again examined his abdomen, and thought there was a little more resistance in the right renal region than in the left. He also at one time thought that he felt a tenderness there during my examination. The rectal examination showed a prostate of moderate size, but nothing above the prostate, either of tenderness or hardness, in the region of the ureter.

The evidence seemed to show that the function of the kidneys had been interfered with by some mechanical obstruction, probably a stone, and an operation was advised for its removal.

In view of the total suppression of urine, accompanying the attack of pain in the left side, it was thought probable that the right kidney had previously been rendered useless, either by destruction of its secreting portion, or by blocking of its ureter, and that now a calculus had shut off the secretion of the remaining kidney. There was no evidence to indicate the seat of the calculus, and it was designed to open the abdomen by a median incision, to examine both kidneys and their ureters, and then to proceed, in the best way possible, to the correction of whatever condition was found. This plan was agreed to, and the patient having been removed to a private hospital, the operation was performed on the morning of December 14th, between seven and eight days after the establishment of complete anuria.

On the morning of the operation he had begun to show evidence of constitutional disturbance. The pulse and temperature had risen decidedly, and there was some commencing mental hebetude.

The operation was done under ether. The hand was introduced into

the abdomen through a median incision between the umbilicus and pubes. The right kidney was felt to be enlarged to perhaps three times the normal size; its surface was irregular and divided into large lobes. Careful palpation of the ureter was difficult, on account of the abundance of fat in the post-peritoneal tissues, but no hardness suggesting a stone could be felt anywhere in that pelvis or ureter. The left kidney was of normal size, and its pelvis was not distended with fluid. The ureter on this side was followed down with great care, from the kidney to the bladder, but nothing like a stone could be detected. The bladder was contracted in the pelvis. The condition of things thus far confirmed the previous opinion, that the right kidney was previously disabled, and it also strengthened the belief that the stone which caused the final suppression was blocking the left kidney.

With the object of more carefully palpating this organ, which was deeply buried in fat, I made an oblique incision in the left loin and uncovered that kidney. With one hand in the abdomen and the other in the wound in the loin, very careful search of the pelvis of the kidney and of the upper part of the ureter was possible, but the result was negative.

The operation was now abandoned, as there was no light by which further action could be guided, and the abdomen was closed; the wound in the loin being drained and partly closed. The opinion was expressed to the friends that possibly our thorough manipulation would be found to have dislodged the obstructing body, but that failing in this we had accomplished nothing.

The patient recovered from the ether well, and about three hours later, when I saw him, there was a slight escape of urine through the urethra, and on passing the catheter, thirty-seven ounces of light-colored urine were drawn. This flow continued, so that partly by the natural efforts and partly by catheter, two gallons of urine were obtained in the first twenty-four hours. In the second twenty-four hours the amount fell to about five quarts, and after that there was a steady, gradual diminution, until the daily amount had reached the neighborhood of seventy ounces, at which it held.

Convalescence was satisfactory, and about a fortnight after the operation I washed out the bladder with a litholapaxy pump, obtaining a few grains of calcareous matter, thus completing the evidence that the

ureter had been stopped by a calculus, which had been displaced by my manipulations.

In this case the condition of the left kidney is to me of especial interest. The fact that the pelvis was not distended with urine seems to show that the function of this organ was stopped at once by an inhibitory action due to the irritation of the calculus in that ureter, and was not due wholly to the obstruction to the flow of urine and to the back pressure exercised by this obstruction. This cessation of the secretion of urine in this kidney would explain the short duration of the pain when this ureter was blocked. Had the urine continued to be excreted, the internal pressure in the kidney would probably have caused a longer duration of pain, and it would have been much more severe in character.

A laparotomy for the determination of the site of a calculus in the ureter is no new thing, and its importance has been alluded to by me in an article upon "The Surgery of the Ureter," read before this Association, and published in the *American Journal of the Medical Sciences*, for January, 1892.<sup>1</sup> In cases previously reported, this exploration succeeded in locating the position of the stone and in making its removal possible.

The case which I have reported illustrates another way in which this operation may be of use, by enabling us to assist the passage of the stone along the ureter, and thus to relieve the dangerous suppression caused by its presence there. The calcareous matter pumped from the bladder in my case, was so small in amount that, put together in the form of a consistent stone, it would not make a mass which one would expect to recognize by palpation through the walls of a ureter surrounded by thick layers of fat, as they were in this instance. The accidental efficacy of the kneading which was given to the kidney and ureter during my thorough examination of them, would suggest the importance of this massage being systematically carried out in a similar case, where a calculus could not be discovered.

Shortly after the occurrence of my case, I found in the *Annales des Maladies des Organes Genito-Uriinaires* for January, 1892, the report of a case by M. Duffau-Lagarosse, which in many respects would seem to be very similar to the case which I have reported.

<sup>1</sup> See page 29 of this pamphlet.

The patient, a man of fifty-nine, had not urinated for eight days. Three weeks before he had been seized, without appreciable cause, with a severe pain in the right lumbar region. This was accompanied by vomiting and scanty and bloody urine. After this there were fifteen days of comfort, and then the complete anuria appeared.

A calculus being suspected, an incision was made into the right kidney through the loin. Nothing was found, and the patient died the following day. At the autopsy the left kidney was found to be completely destroyed, while the right ureter was stopped by a calculus of the size of a grain of rice, which was lodged in the lower part of the canal.

The reporter draws two conclusions, first, that anuria induced by reflex action is a rarity; and, second, that the diagnosis of the seat of the calculus is very difficult, and indeed impossible.

In this case the small size of the calculus and its lodgment in the lower part of the canal, would probably have made its discovery difficult or impossible. Had the kidney continued to excrete urine behind so small a stone, its passage onward into the bladder would probably have been assured. In the absence of this pressure from behind, it would seem as if this were distinctly a case in which a median laparotomy and massage of the ureter from above downward might have accomplished the escape of the calculus and the recovery of the patient.

I cite this case simply to show that this condition is one which we must be on the lookout for.

The subsequent history of the case I have reported is interesting in some particulars.

Not long after the patient had gone from the hospital, while he was moving about the house freely, he had another attack of discomfort in the left side of the abdomen, accompanied by a chill and high temperature. I saw him after this had persisted for a good many hours, and found him passing an abundant quantity of water, but still suffering from discomfort through the lower part of the abdomen on the left. Careful examination detected nothing abnormal in that region.

Remembering the experience of the previous attack, I made considerable massage through the abdominal wall, down along the course of the ureter and as deeply into the pelvis as I could reach. When I saw him a day or two later, he told me that from the time of my ex-



amination he was comparatively comfortable, and had no more of that seriously uncomfortable pain from that time. A week or two later a stone was passed that was decidedly larger than the calculous bits that were obtained by pumping after the operation. I have not seen the patient since, but have heard that he has had still another attack of pain, with again the passage of a stone.

The conclusions which I should draw from the experience gained in this case, and by a study of the literature that I have made, are:

(1) That in a calculous patient, or in a patient with a distinct attack of renal colic, the suppression of urine should be regarded as directly due to the stone, and that in the majority of cases, both kidneys will be found to be disabled; for the cessation of the function of a healthy kidney, due to the irritation of a stone in the opposite ureter, must be very rare.

(2) These cases should be treated by operation as soon as it is evident that the function of the kidney has come to a standstill, as there is little chance of the stone being pushed along the ureter when the kidney is no longer excreting urine behind it.

(3) In the absence of any evidence as to the location of the calculus, the first step in such an operation should be a median laparotomy, with the hope of discovering the whereabouts of the calculus, in order to proceed intelligently for its removal.

(4) If by this examination no calculus can be found, so that further operative procedure cannot be decided upon, a steady massage of the pelves of the kidneys, and of the ureters, from above downward, should be practised, in the hope of dislodging or breaking up a small calculus, if such exists.





